

Photo from June Russell

Variety Evaluation for Pasta Making and Sensory Quality



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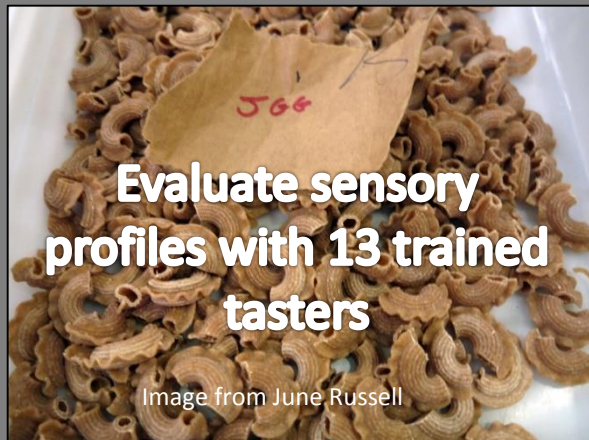
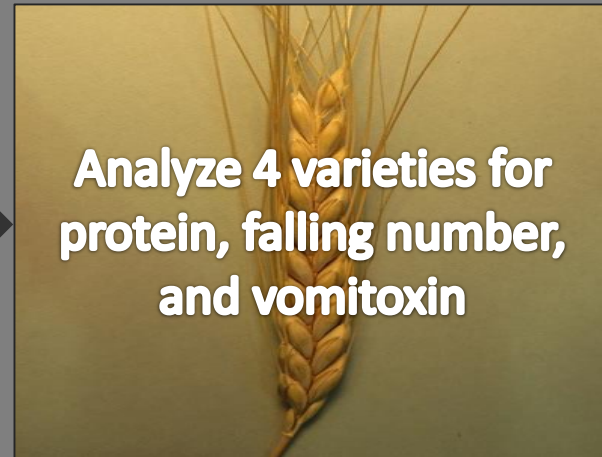
Preliminary Data – 30 March 2015

This work is part of “Value-added Grains for Local and Regional Food Systems”, supported by an OREI grant of the USDA





Evaluation Process:

Emmer varieties were screened for use in local organic food systems



Overview of Results

Variety	Yield	Test Weight	Protein	Pasta Preference	Pasta Shininess	Pasta Roughness	Pasta Graininess	Pasta Firmness	Ability to Dissolve	Grain Preference	Grain Texture
Name	Rank [¥]	Rank [¥]	%	Probability	10=shiny	10=rough	10=grainy	10=chewy	seconds	Probability	10=chewy
Lucille	1	6	14.1	0.42*	5.24	4.58	3.88	4.46*	11.12	0.19	5.42*
ND Common	2	2	13.5	0.19*	5.88*	3.46*	3.61	3.63*	10.12	0.42*	6.27*
Red Vernal	4	4	15.0	0.27	4.84*	5.04	5.65*	6.21*	13.50*	0.15	6.19

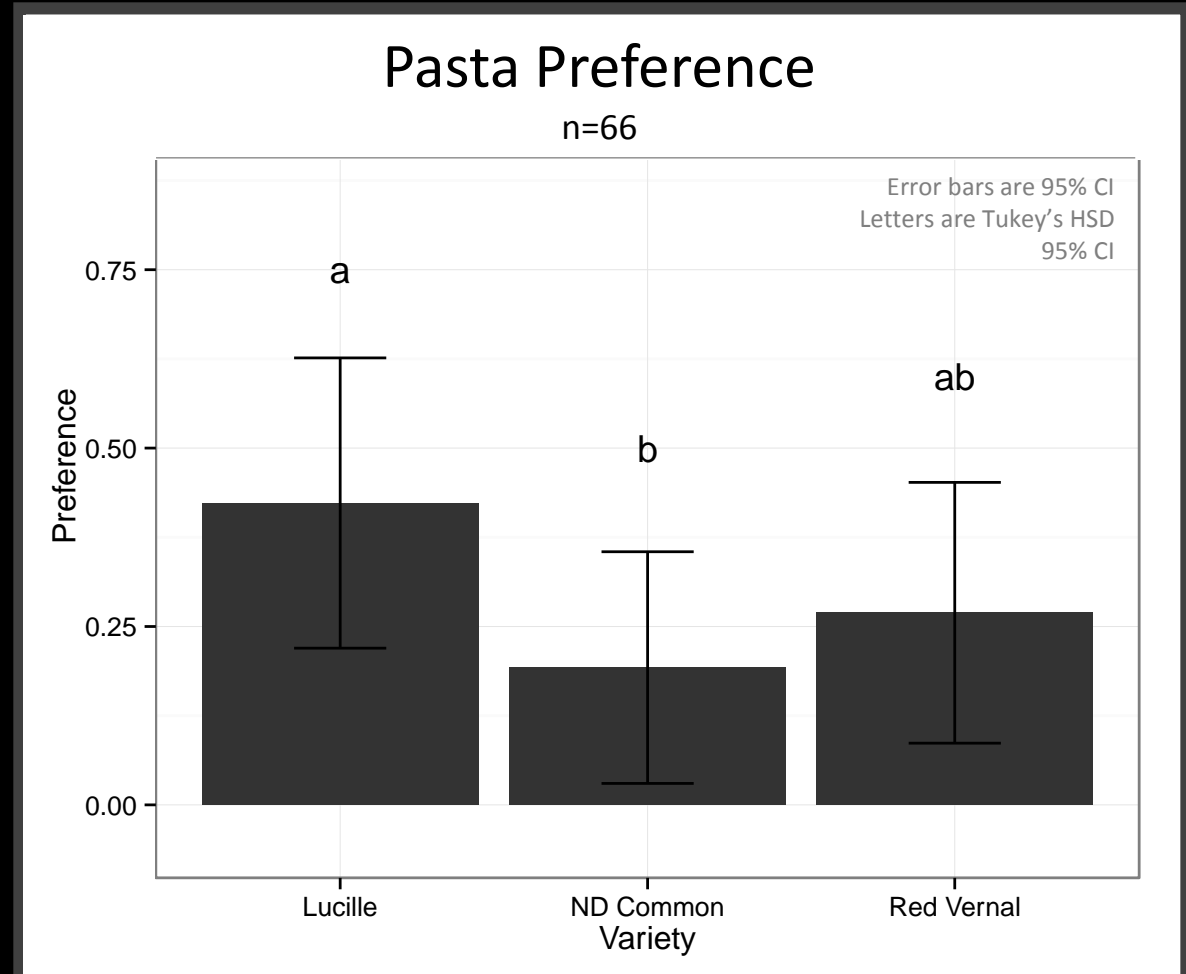
 higher scoring,  lower scoring, *significantly lower or higher than other varieties at p<0.05

Sensory evaluations were conducted on material blended 45% from 2012 and 55% 2014 harvested emmer from one site in Freeville, NY
[¥] Rank is out of 14 total entries at three sites (Pennsylvania; Freeville, NY; Willsboro, NY) and three years (2012-2014)

Pasta Sensory Evaluation

13 tasters evaluated 3 varieties over 2 replicates

- **Lucille:** high preference, shininess and roughness; low graininess, cohesion, and firmness
- **Red Vernal:** high preference, roughness, graininess, cohesion, firmness, and earthy flavor; low shininess
- **ND Common:** low preference, roughness, graininess, cohesion, and firmness; high shininess



There were significant differences in preference among varieties at $p=0.032$

Type 3 ANOVA

$H_0: \beta_1=0; \alpha \leq 0.10$

$Y_{ijk} = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \beta_3 x_{i3}$

Y_{ij} : log odds of a flavor used for sample

β_0 : intercept log odds

β_1 : partial slope associated with variety

x_{i1} : fixed variable of variety i

β_2 : partial slope associated with rep

x_{i2} : fixed variable of rep i

β_3 : partial slope associated with taster

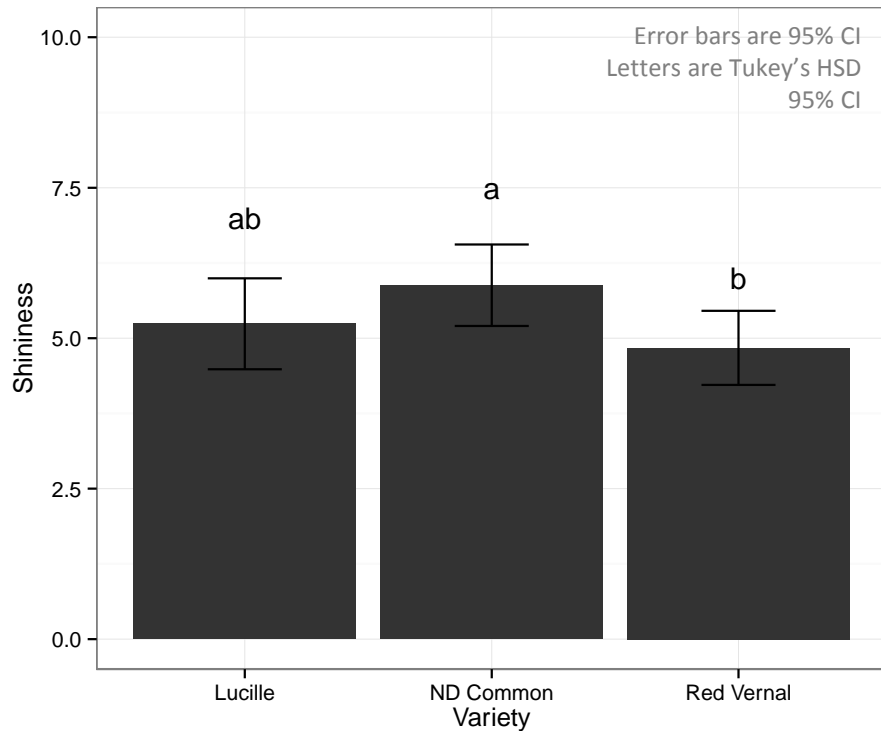
x_{i3} : random variable of taster l

Pasta Sensory Evaluation

Shininess

(1 = matte, 10 = slightly glossy)

N=75

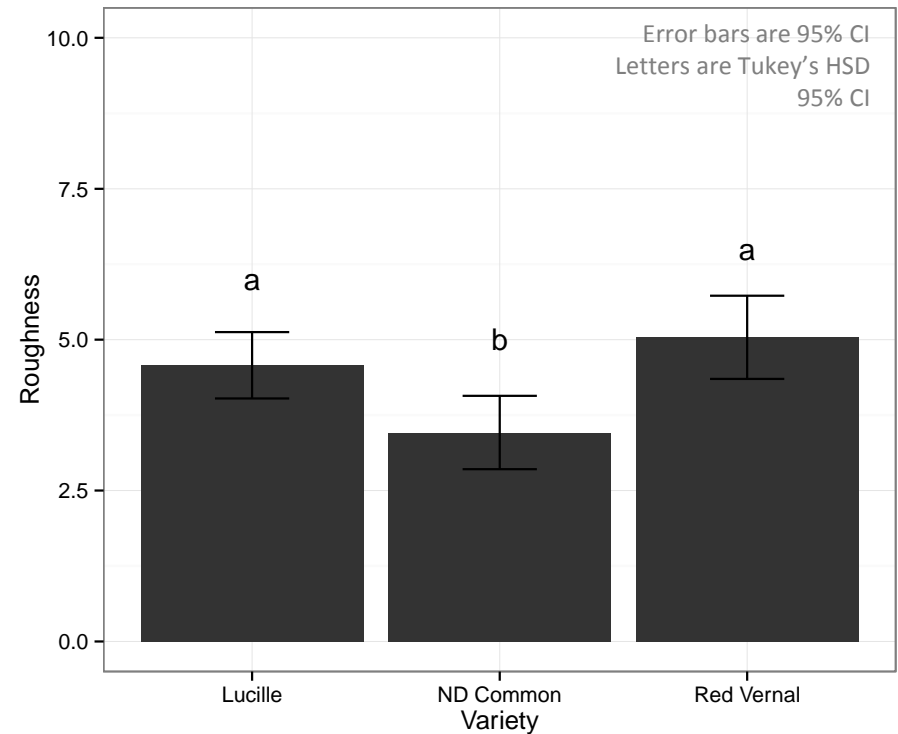


There were significant differences among varieties at $p=0.035$.
Subject accounted for 31.76% of variance.

Surface Roughness

(1 = smooth, 10 = rough and coarse)

N=78



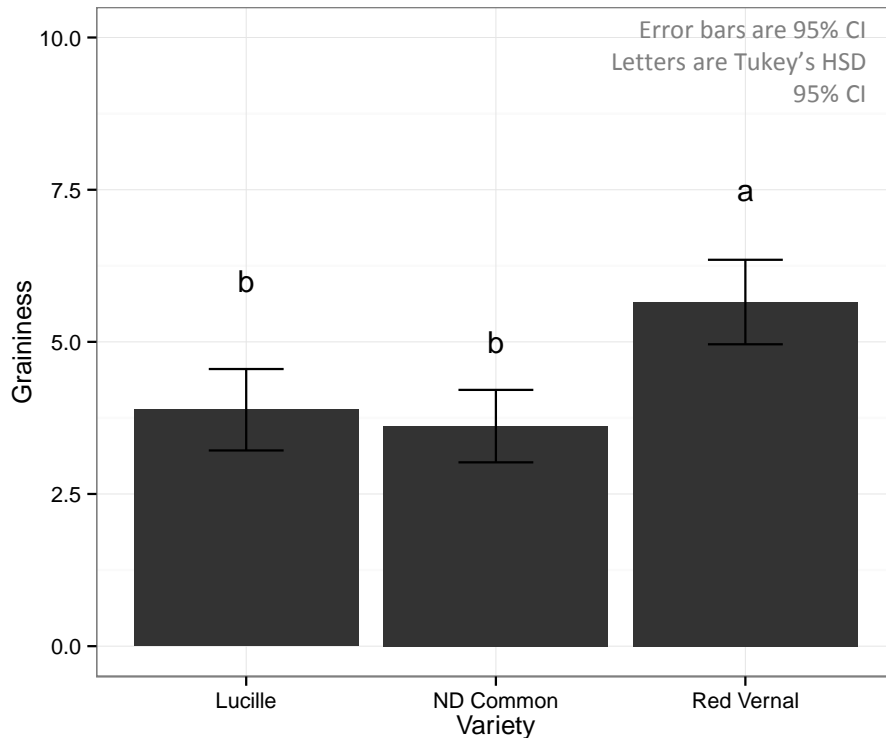
There were significant differences among varieties at $p=0.005$.
Subject accounted for 15.97% of variance.

Pasta Sensory Evaluation

Graininess

(1 = smooth, 10 = very grainy)

N=78

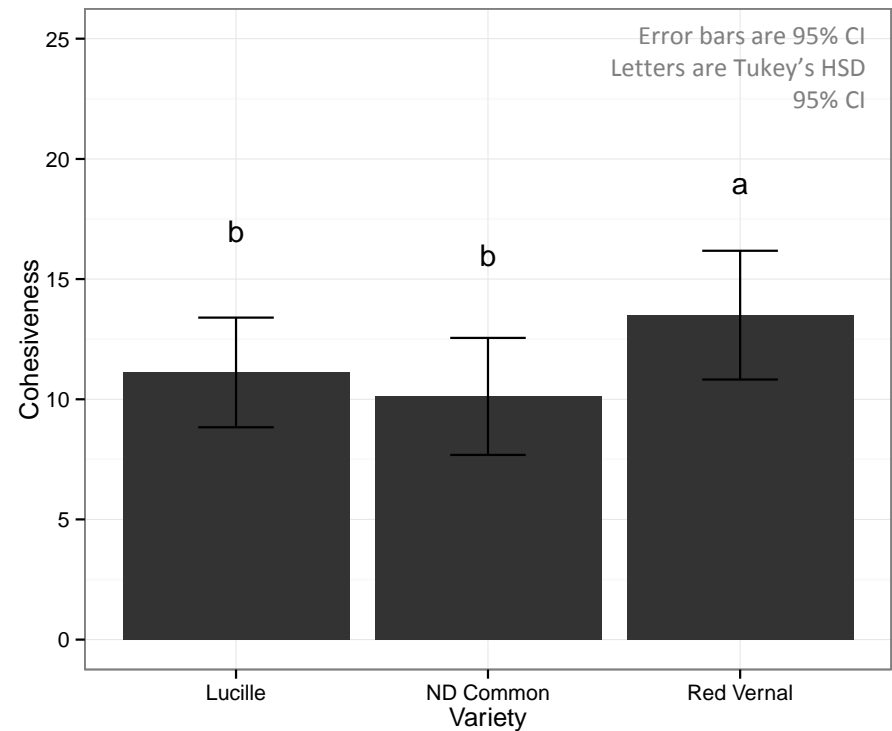


There were significant differences among varieties at $p < 0.0001$.
Subject accounted for 17.74% of variance.

Cohesion of mass

(seconds)

N=78



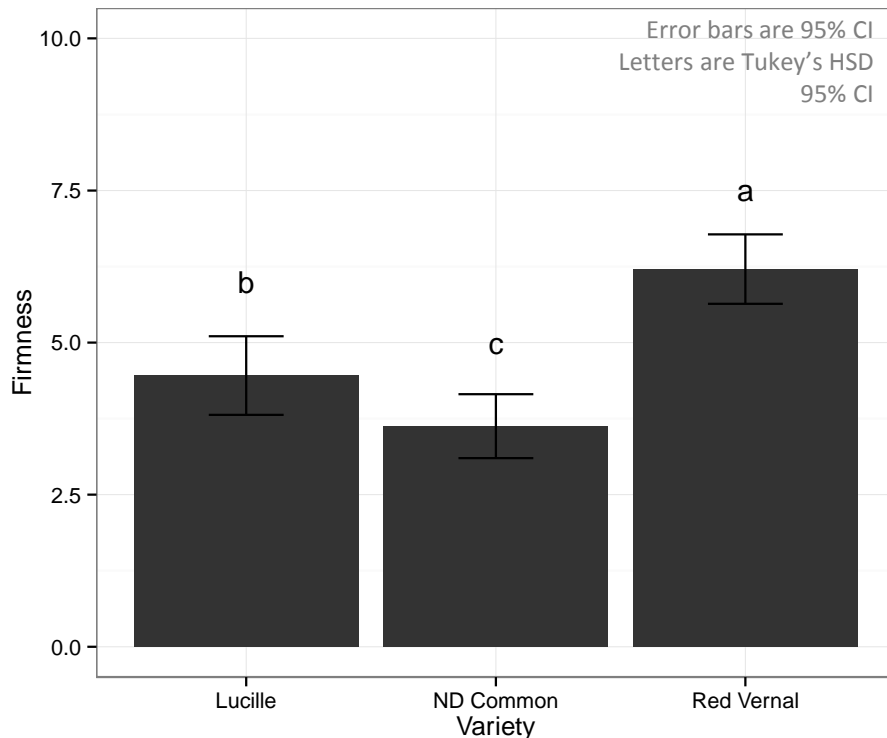
There were significant differences among varieties at $p < 0.0001$.
Subject accounted for 88.26% of variance.

Pasta Sensory Evaluation

Firmness

(1 = falls apart, 10 = very chewy)

N=72



There were significant differences among varieties at $p < 0.0001$.
Subject accounted for 44.89% of variance.

Surface stickiness ($p=0.759$)
and starch texture ($p=0.300$)
not significantly different
among varieties

Type III ANOVA with Satterwaite approximation

$H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6 = \mu_7$; $\alpha \leq 0.05$

$$Y_{ijk} = \mu + \alpha_i + \beta_j + \gamma_k + \epsilon_{ijk}$$

Y_{ij} : response for variety i , rep j , order k , and subject l

μ : overall mean response

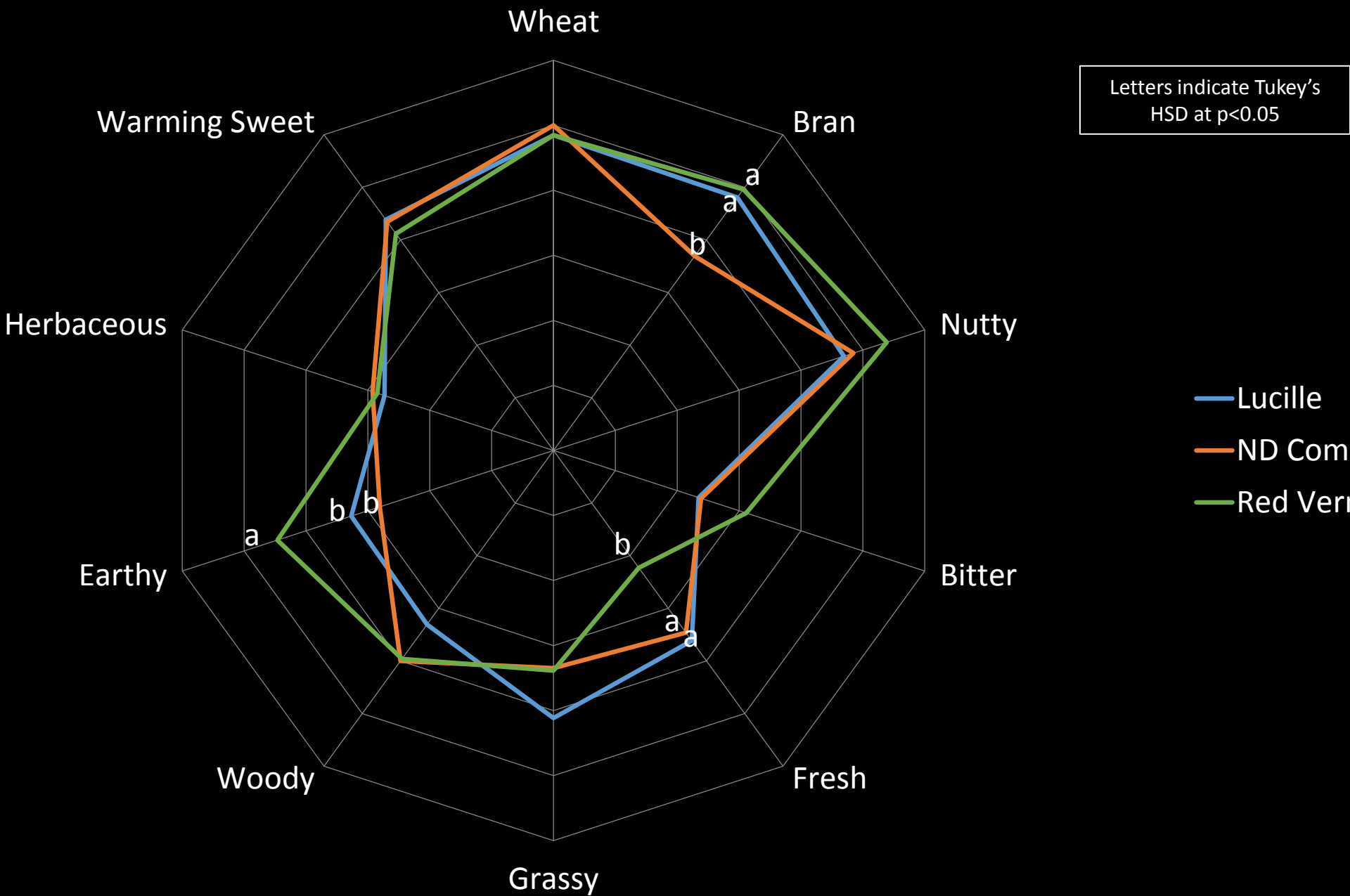
α_i : fixed effect of variety i

β_j : fixed effect of rep j

γ_k : random effect of subject k

ϵ_{ijk} : experimental error associated with response l, j, k

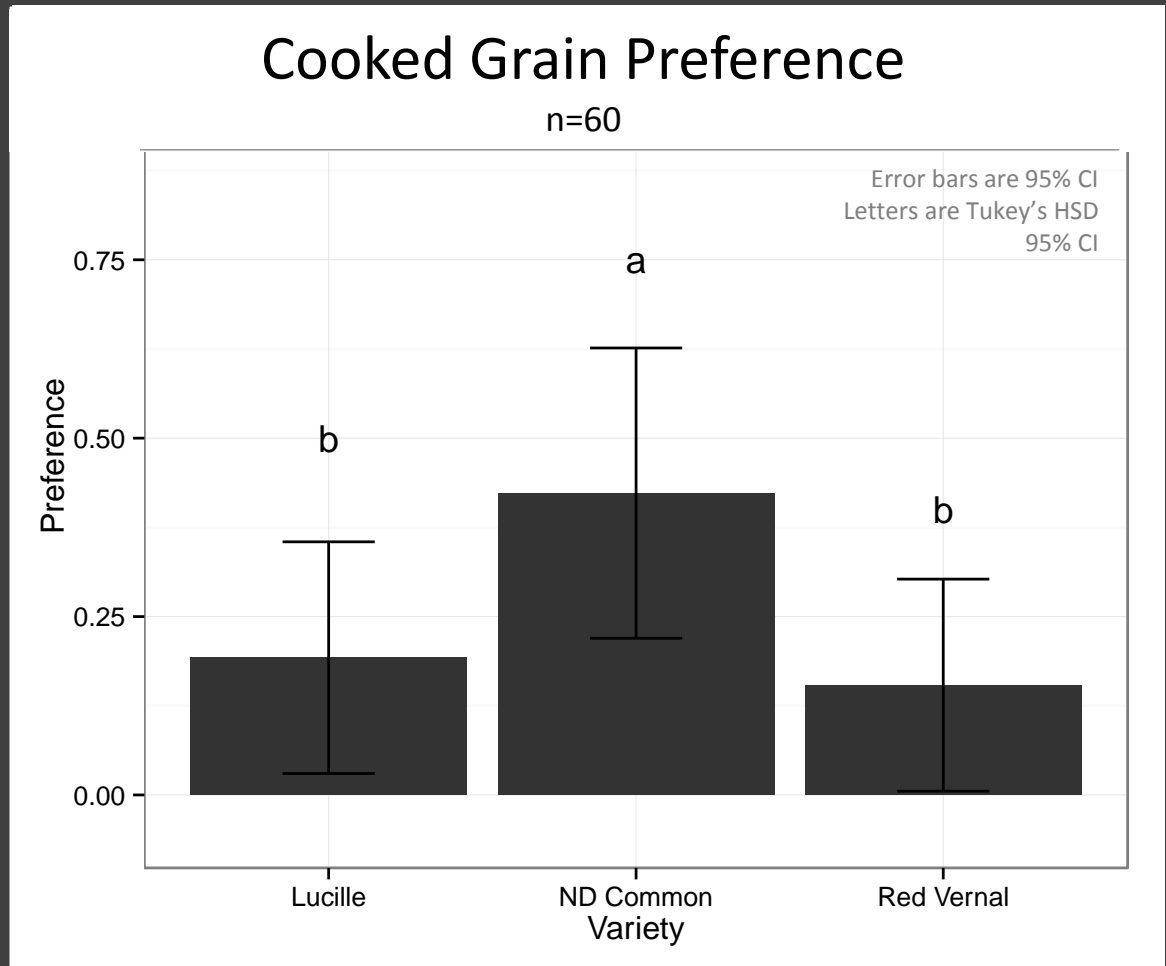
Pasta Intensity of Various Flavors



Cooked Whole Grain Sensory Evaluation

13 tasters evaluated 3 varieties over two replicates

- **ND Common:** highest preference and most chewy texture, dominated by bran, woody, wheat, and nutty flavors
- **Lucille:** low test preference, least chewy, dominated by nutty, wheat, and grassy flavors
- **Red Vernal:** low preference, dominated by earthy, bitter, and wheat flavors



There were significant differences in preference among varieties at $p=0.038$

Type 3 ANOVA

$H_0: \beta_1=0; \alpha \leq 0.10$

$Y_{ijk} = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \beta_3 x_{i3}$

Y_{ij} : log odds of a flavor used for sample

β_0 : intercept log odds

β_1 : partial slope associated with variety

x_{i1} : fixed variable of variety i

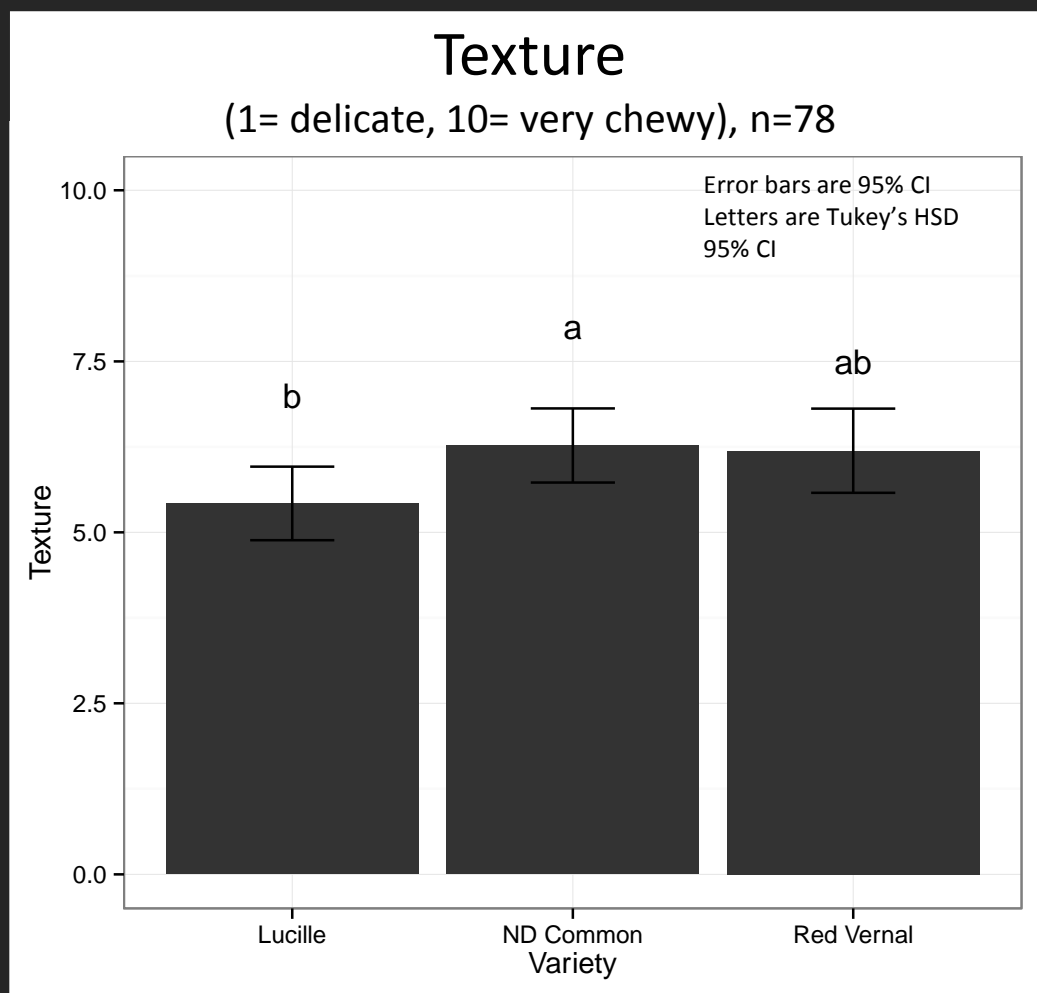
β_2 : partial slope associated with rep

x_{i2} : fixed variable of rep i

β_3 : partial slope associated with taster

x_{i3} : random variable of taster l

Cooked Whole Grain Sensory Evaluation



There were significant differences among varieties at $p=0.033$. Subject accounted for 21.96% of variance.

Whole grain taste intensity ($p=0.326$) and dryness ($p=0.539$) were not significantly different by variety.

Type III ANOVA with Satterwaite approximation
 $H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6 = \mu_7; \alpha \leq 0.05$

$$Y_{ijk} = \mu + \alpha_i + \beta_j + \gamma_k + \epsilon_{ijk}$$

Y_{ij} : response for variety i , rep j , order k , and subject l

μ : overall mean response

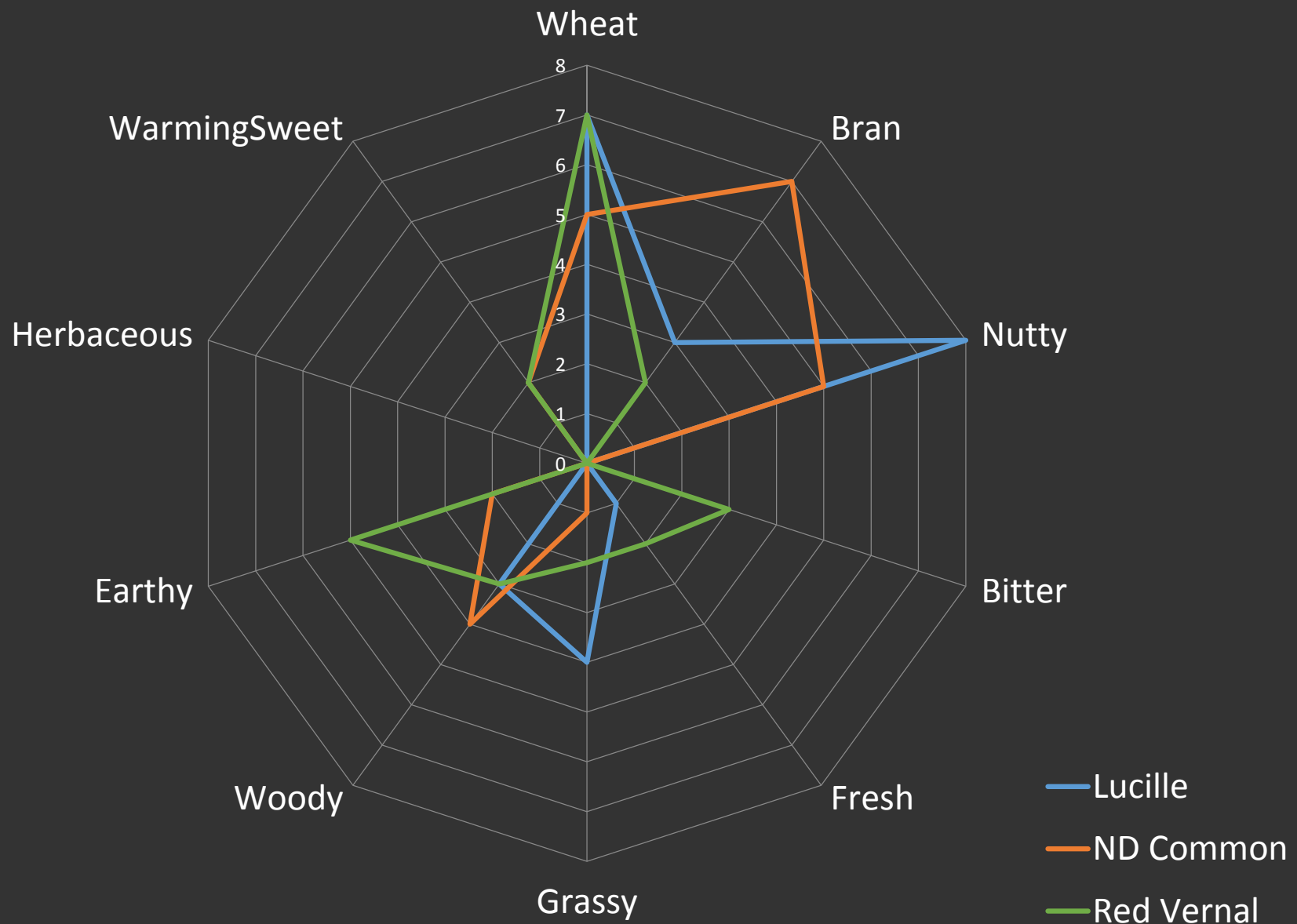
α_i : fixed effect of variety i

β_j : fixed effect of rep j

γ_k : random effect of subject k

ϵ_{ijk} : experimental error associated with response l, j, k

Cooked Whole Grain Most Prominent Flavor



Cooked Whole Grain Public Preference Tasting

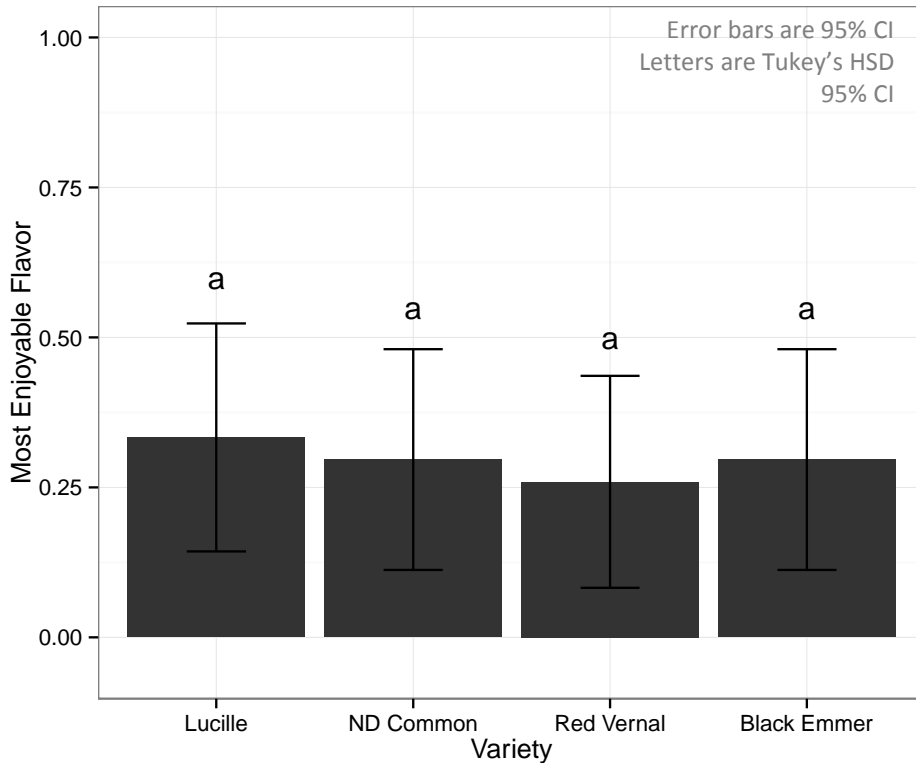
26 tasters evaluated 4 varieties in one replicate

Varieties were grown at a different site than the materials used for the sensory evaluation

Black Emmer was grown as a winter at a different site than the spring-grown Lucille, ND Common, and Red Vernal

Most Enjoyable Flavor

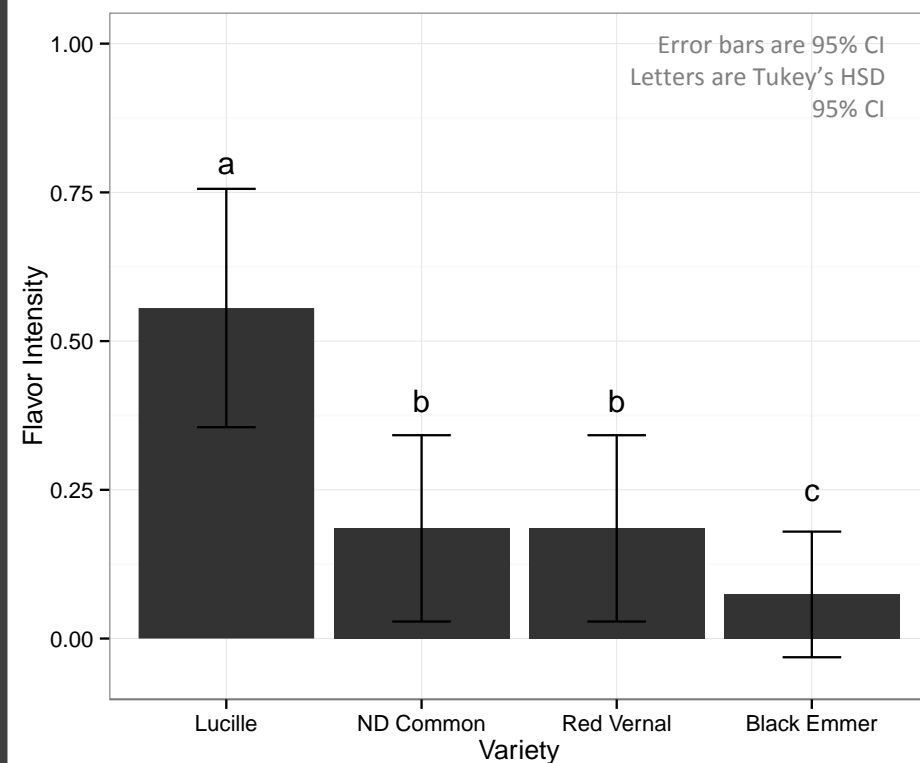
N=108



There were no significant differences in probability of being rating as most enjoyable flavor among varieties at $p=0.55$

Most Intense Taste

N=108



There were significant differences in probability of highest taste intensity among varieties at $p<0.0001$

Type 3 ANOVA
 $H_0: \beta_1=0; \alpha \leq 0.10$
 $Y_{ijk} = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2}$

Y_{ij} : log odds of a flavor used for sample;
 β_0 : intercept log odds; β_1 : partial slope associated with variety; β_2 : partial slope associated with taster
 x_{i3} : random variable of taster i ; x_{i1} : fixed variable of variety j